DOCUMENT RESUME

ED 128 208 SE 021 291

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TITLE Marine Science Education Materials and Their Usefulness.
PUB DATE [76]
NOTE 54p.

EDRS PRICE MF-$0.83 HC-$3.50 Plus Postage.
DESCRIPTORS *Bibliographies; Curriculum; *Elementary Secondary Education; *Instructional Materials; *Marine Biology; *Oceanology; Science Education; Sciences

ABSTRACT

Listed are educational materials related to marine science for elementary and secondary schools. The materials were collected and categorized according to subject matter content, grade level of usefulness, and type of publication, e.g., pamphlet, report, periodical, and papers. The source of each document is included as well as a brief annotation of each document. In all, 289 documents are categorized. Tables are presented to show the listings. Tables are divided into four sections: (1) titles, (2) source, (3) usability, and (4) contents. One of the tables classifies materials by usability and grade levels. (EB)

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Marine Science Education Materials

and

Their Usefulness

by

Richard M. Schlenker

SE 021 291

Abstract

A query letter was sent to a selected group of govermental and other institutions in an attempt to ascertain the types of information available for use in precollege marine science instruction. The materials which were collected were categorized according to subject matter content, grade level of usefulness, type of publication e.g. pamphlet, report, periodical, paper etc. The source of each document was included as well as brief annotation of each document. In all, 289 documents were categorized.

Introduction

On October 15, 1966, public law 89-688, National Sea Grant College and Program Act was signed into to law. The passage of this law came at a time when Americans were showing a renewed interest in the marine environment and a concern for the depletion of economically important species through over fishing. Public debate continued, focusing eventually on a 200 mile seaward territorial limit. Earney (1975) points out that the original impetus for the 200 mile was set forth in the Truman Doctrine of 1945. In any event, interest and concern continued and grew, culminating in the recent passage of a public law which extended the seaward territorial control of offshore areas to a point 200 miles beyond the shore of the U.S. coast. What significance do these events have for precollege marine science education?

Interest in the 200 mile limit might be interpreted as a general concern for the marine environment, as well as a realization that man is an integral part of that environment. The passage of public law 89-688 suggests that the American public is willing to provide public monies for education related to the marine environment. Implicit in the passage of 89-688 is the idea that contemporary Americans want future generations to be able to cope with marine problems with less naivete than they must.

Since 89-688 was passed, several projects have been conducted which involved the development of curriculum materials, laboratories etc. for precollege marine science instruction. Little; however,

has been accomplished in the area of marine science teacher education. With National Sea Grant funding, a project was recently started at the University of Maine at Orono in the marine science education area. The goal of this project is to develop a marine science education module which will be included in the current secondary science methods course. This project owes its genesis to a concern on the part of the Department of Science Education that the majority of preservice science teachers were poorly prepared to offer any sort of marine science instruction.

One of the first stages of the project concerned itself with ascertaining what materials might be available to use in the precollege marine science class. In an effort to answer this question, governmental and other institutional sources were queried. The second question of importance at this stage of development was, after abstraction, what was the usability of these materials in the precollege classroom? We followed this course since we felt that whatever materials, to which we introduced preservice teachers, inservice teachers could acquire, abstract and use. Additionally, we felt that materials from a variety of sources of a variety of authors would better serve the needs of the teachers generally than a one text, one laboratory treatment of the ocean environment. These concerns become paramount when one considers that currently marine sciences are offered primarily on a curriculum infusion basis.

Materials collection was accomplished by sending a letter (see appendix) to a selected group of governmental and private organizations. The returns of this information search are included in the following tables. For each listing within each table, the source, usability level

and contents are included. The determination of a given document's usability level was somewhat subjective. It is perhaps reasonable to assume that the extent of usability of any entry is limited only by the skill of the abstractor.

The materials were categorized in a number of ways, as is reflected by the titles of the individual tables. Authors were included when this information was provided in the document which is described.

The listings in these tables should in no way be interpreted as being exhaustive. These listings perhaps only provide a good point of departure.

Table 1

Bibliographies

The table is divided in four sections. The title and source are listed on the first of each pair of pages. The page following each title page contains the usability and contents information for each title.

Title	Source
1. Sea Grant Publications Index. Vol. 1 & 2, 1973	1. National Sea Grant Depository. Pell Marine Science Library. University of Rhode Island 02882.
2. NOAA Technical Memorandum. EDS ESIC-8 (Sea Grant Publications Index) Vol. 1 & 2. 1968-72.	2. Same as #1.
3. Sea Grant Publications Index. Vol. 1 & 2. 1974.	3. Same as #1.
4. The University of Maine's Coherent Project Sea Grant Program. Vol. 1 & 2. 1973.	4. Marine Extension Agent. Ira C. Darling Center University of Maine, Walpole, Maine 04573.
5. A Cooperative University Institutional Sea Grant Program Proposal. 1976. July 1975.	5. Same as #4.
6. University Curricula in the Marine Sciences and Related Fields. Academic years 1973-1974, 1974-1975. Revised by Interagency Committee on Marine Science and Engineering Federal Council for Science and Technology.	6. Director National Sea Grant Program National Oceanic and Atmospheric Administration Department of Commerce Rockville, Maryland 20852
7. University Curricula in the Marine Sciences and Related Fields. Academic years 1975-1976, 1976-1977. Revised by Interagency Committee on Marine Science and Engineering Federal Council for Science and Technology.	7. Director National Sea Grant Program National Oceanic and Atmospheric Administration Department of Commerce 300 Whitehaven St., N.W. Washington, D. C. 20235

Usability	Contents
1. All levels-requires abstraction by users.	1. Indexes all materials received by the National Sea Grant depository in 1973.
2. Same as #1.	2. Same as #1 except for the years, 1968-1972.
3. Same as #1.	3. Same as #1 except for the year, 1974.
4. Same as #1.	4. Indexes the Sea Grant proposal effort of the University of Maine for the 1973-74 period. Contains some useful marine bibliographical information.
5. Same as #1.	5. Indexes the Sea Grant proposal effort of the University of Maine for the calendar year 1976. Contains some useful marine bibliographical information.
6. Good for all levels of career education, but requires abstraction before use.	6. Includes a listing of 164 post-secondary institutions which offer marine science programs. Institutions listed had to offer 25 or more semester hours in the marine science field.
7. Same as #6.	7. Same as #6 except that this publication lists 225 institutions.

Title	Source
8. Biennial Report 1971-3. 1973.	8. Hawaii Institute of Geophysics University of Hawaii Honolulu
9. Science and Mathematics Curricular Developments Internationally 1956-1974. J. David Lockard(ed) Ninth Report of the International Clearinghouse on Science and Mathematics Curricular Developments.	9. Science Teaching Center of the University of Maryland College Park, Maryland
10. Index of the National Park System.	10. Director National Park Service C St. Between 18th and 19th, N.W. Washington, D.C.
11. NIH Publications List. 1975	11. U.S. Dept. of HEW Public Health Service National Institutes of Health Bethesda, Maryland 20014
12. Marine Related Films by Paul Ring Developed under Sea Grant.	12. Same as #4.
13. Books and Articles About the Sea.	13. Office of Educational Programs Wometco Miami Seaquarium, Rickenbacker Causeway Miami, Fla. 33149
14. Reading in Marine Science by Victor T. Neal & Sally A. Kulrn. Published by Division of Continuing Education of the Oregon State System of Higher Ed. 1968.	14. Dept. of Oceanography Oregon State University Corvallis, Oregon
15. Coastal Engineering Research Center (CERC) and Beach Erosion Board Publications List, 1976.	15. U.S. Army, Corps of Engineers Coastal Engineering Research Center Kingman Building Ft. Belvoir, Va. 22060

Usability	Contents
8. All levels-requires abstraction by users.	8. Lists the activities of the Institute of Geophysics during the inclusive period. Include some useful marine bibliographical information.
9. A good source of information describing what others in the field are doing.	9. Lists a few marine science programs which were developed with the aid of the Elementary Secondary Education Act.
10. A good guide for choosing marine science field trip sites.	10. Lists all of the national parks, and categorizes them several different ways.
11. K-college, must be abstracted by the user.	11. Lists publications directed at improving the general health of the American public.
12. K-college.	12. Lists films related to the marine environment which are held by the University of Maine at Orono, film library.
13. Same as #11.	13. This is an annotated bibliography of books and articles in the marine science field.
14. K-12, must be abstracted by the user.	14. Lists texts in all of the oceanographic fields, including history and exploration.
15. Same as #11.	15. A guide to publications of the CERC and those resulting from the general investigation of the Tidal Inlets Program. Contains excellent marine scientific information.

Title	Source
16. Annual Report University of Miami Dorothy H. and Lewis Rosenstiel School of Marine and Atmospheric Science 1972-1973.	16. University of Miami 4600 Rickenbacker Causway Virginia Key Miami, Fla. 33149
17. Annual Report University of Miami Dorothy H. and Lewis Rosenstiel School of Marine and Atmospheric Science 1973-1974.	17. Same as # 16.
18. Annual Report University of Miami Dorothy H. and Lewis Rosenstiel School of Marine and Atmospheric Science 1974-1975.	18. Same as #16.
19. Childrens Books 1970 by Virginia Haviland and Lois B Watt. Library of Congress Card No. 65-60014	19. Superintendent of Documents U.S. Government Printing Office Washington, D.C. 20402
20. Science and Mathematics Books for Elementary and Secondary Schools by Lois B. Watt, Delia Goetz, Eunice von Ende. Educational Materials Center U.S. Dept. of Health Education and Welfare Catalog No. HE 5.229:29071. 1970.	20. Same as #19.
21. Publications Listing 1975	21. National Academy of Sciences National Research Council 2101 Constitution Ave Washington, D.C. 20418

Usability	Contents
16. K-college, career as well as scientific value.	16. Lists the schools activities for the inclusive period. Includes some useful marine bibliographical information.
17. Same as #16.	17. Same as #16.
18. Same as #16.	18. Same as #16.
19. Good for the preschool through junior high school age students.	19. Lists books in the marine science field. Gives descriptions of the listings as well as the applicable grade level for each listing. The Library of Congress number is included for each listing.
20. K-12.	20. Lists texts, some of which are useful for instruction in the marine science field. Each listing has an applicable grade level included.
21. Depends on the needs of the individual teacher.	21. Lists publications by the National Academy of Sciences, the National Academy of Engineering, the National Research Council and the National Institute of Medicine. There are some listings useful in marine science instruction.

Title	Source
22. Course and Curriculum Improvement Projects. The National Science Foundation. Stock No. 3800-00179	22. Same as #19.
23. Popular Publications of the United States Geological Survey.	23. Geological Inquiries Group U.S. Geological Survey-907 Reston, Va. 22092
24. A Selected Bibliography of Popular Literature on Marine Mammals. By Helenmarie Hofman	24. Marine Mammal Commission 1625 Eye Street, N.W. Washington, D.C. 20006
25. List of Publications and Contributors. 1974	25. Same as #4.
26. United States Government Printing Office Public Documents, Weather. 1975.	26. Same as #19.
27. Lamont-Doherty Geological Observatory of Columbia University Yearbook 1974.	27. Lamont-Doherty Geological Observatory Palisades, New York 10964
28. Publications of the National Academy of Engineering 1964-1974.	28. National academy of Engineering 2101 Constitution Avenue, N.W. Washington, D.C. 20418
29. Corrosion Resistance of Metals in Hot Brines: A Literature Review. 1973. by Lloyd H. Banning. U.S. Department of the Interior, Bureau of Mines Information Circular 8601. Catalog No. 128.27:8601.	29. Same as # 19.
30. Cousteau Group 35mm Sound Filmstrips, 1974.	30. The Cousteau Society Inc. 777 Third Avenue New York, N.Y. 10017
31. Books by Jacques-Yves Cousteau	31. Same as # 30.

Usability	Contents
22. K-12.	22. Describes the major curriculum projects which in the past have been supported by the National Science Foundation. Some of the projects were oceanographic.
23. Same as #22.	23. Lists brief publications, many of which could be useful in marine science instruction.
24. Ages 4 through adult.	24. Age leveled books and periodicals about marine mammals.
25. K-12, must be abstracted by the user.	25. Lists articles in several categories e.g. pollution, pesticides etc.
26. Same as #25.	26. Lists many publications in the field of marine weather.
27. High school.	27. Lists the 1974 activities of the Observatory. Includes a list of articles which were published as a result of the 1974 activities.
28. K-college, must be abstracted by the user.	28. Contains some book length publications useful in marine science education.
29. All levels after abstraction.	29. Contains a bibliography of articles on the subject and a review of those articles.
30. All.	30. Lists film strips about the marine environment, their cost and source.
31. Same as #30.	31. Lists publications about the marine environment, primarily of a biological nature.

Title	Source
32. Colleges and Universities which offer courses and Degrees in Oceanography and Marine Sciences, 1969-70.	32. Public Affairs Officer Scripps Institution of Oceanography 8602 La Jolla Shores Drive La Jolla, California 92093
33. Some References on Underwater Habitat.	33. Same as #32.
34. Sharks some useful References.	34. Same as #32.
35. Selected References on Submarine Geology and Underwater Exploration, Photography and Archaeology.	35. Same as #32.
36. References on Coral and Coral Reefs.	36. Same as #32.
37. Bibliography Marine Communication.	37. Same as #32.
38. References-Dolphins and Porpoises.	38. Same as #32.
39. Seaweed Bibliography.	39. Same as #32.
40. Suggested Elementary Books.	40. Same as #32.
41. Suggested Reading-Intermeniate Level.	41. Same as #32.
42. Oceanography Reading Suggestions.	42. Same as #32.

Usability	Contents
32. Career Education, 7-12.	32. Lists American and Canadian Universities, and types of programs offered in the marine sciences.
33. All levels, after abstraction by the user.	33. Lists articles concerned with life beneath the sea surface.
34. K-college.	34.. Contains references for students, teachers, and general readers.
35. Same as #34.	35. Lists texts in the area described by the title.
36. Same as #34.	36. Same as #35.
37. Same as #33.	37. Same as #35.
38. K-12.	38. Lists many articles on the subject described by the title. Many of the articles are of a popular nature.
39. K-12 career education as well as general science use.	39. Same as #35.
40. Elementary School.	40. Lists 23 texts and includes their grade levels.
41. Junior High School-other areas after abstraction.	41. Lists 7 entries in all the marine areas.
42. Same as #38.	42. Lists books and articles for young, general, and young adults in marine history and career education. Also includes listings of films, charts and marine law publications.

Title	Source
43. Science a Catalog of 16mm Films and Filmstrips.	43. International Film Bureau Inc. 332 South Michigan Avenue Chicago, Ill. 60604
44. Publications 1975 Hawaii Institute of Geophysics.	44. 2525 Correa Road Honolulu, Hawaii 96822 (Publications , Room 262)
45. Selected Readings in the Marine Sciences by the U.S. Naval Oceanographic Office, Washington, D.C.	45. Same as #19.
46. References from the Catalog Library.	46. U.S. Army Engineers Experimental Station Vicksburg, Miss. 39180
47. Catalog of United States Coast Guard Films, CG 386, 1971.	47. Deptartment of Transportation United States Coast Guard USCG Headquaters Washington, D.C. 20590
48. United States Coast Guard International Ice Patrol Reports (CG-188 series).	48. National Technical Information Center (NTIS) U.S. Department of Commerce Springfield, Va. 22151.
49. Bibliography-Books for children that are fun for Adults.	49. Lightship Chesapeake 1200 Ohio Drive, S.W. Washington, D.C.
50. Selected References on Geological Oceanography and Selected Topics.	50. U.S. Department of the Interior Geological Survey Reston, Va. 22092

Usability	Contents
43. 7-12.	43. Lists films and filmstrips, some of which are useful in marine science instruction. Some of the listings are available in Spanish and French.
44. All levels-requires abstraction by user.	44. Lists several hundred articles and technical reports, all in the area of marine sciences.
45. K-adult.	45. Lists publications in the marine field, and gives their level of usefulness. Some of the areas covered are oceanography, marine biology, marine geology, diving etc.
46. High school, lower if properly abstracted.	46. A list of marine science articles, put together upon request of the user.
47. K-12 career education.	47. Lists films in the marine science area and their supply points.
48. High school after abstraction.	48. Lists literature concerned with the Coast Guard's ice patrols and ocean ographic operations.
49. K-adult.	49. Lists texts which are not highly scientific.
50. Same as #49.	50. Lists texts and periodicals, both of a technical and a popular nature.

Title	Source
. Selected List of Maps of Ocean Floors, 1973.	51. Same as #50.
. American Geological Institute Career Guidance Publication.	52. Same as #50.
. Selected U.S.Geological Survey Publications on Marine Geology.	53. Same as #50.
. Occupational Outlook Reprint Series.	54. Same as #19, or regional offices of the Bureau of Labor Statistics.
. University of Wisconsin Sea Grant College Program Publications and Films.	55. Sea Grant Communications Office University of Wisconsin 1800 University Avenue Madison, Wisconsin 53706
. Oceanography in Print (may be out of print).	56. Town of Falmouth Public Schools Falmouth, Ma or the Marine Biological Lab. at Woods Hole, Ma.
. Questions and Answers.	57. Woods Hole Oceanographic Institution Woods Hole, Ma. 02543
. Career Information-Oceanography	58. The Smithsonian Institution Washington, D. C. 20560
. List of Free and Inexpensive Educational Materials.	59. U.S.Department of Commerce NOAA National Ocean Survey Rockville, Maryland 20852
. Maine Sea Grant Publications	60. Same as #4.

Usability	Contents
51. K-adult.	51. Lists sources of maps.
52. High school.	52. Lists publications of the type described by the title and lists their sources.
53. Same as #51.	53. Lists maps, papers, texts and leaflets in the marine geology field and includes their sources.
54. Elementary, junior high and high schools.	54. A bibliography of job classifications and sources of career information.
55. Same as #51.	55. Lists films and publications which have been developed as a result of the University of Wisconsin sea grant effort.
56. Same as #51.	56. Lists texts and articles covering all phases of marine sciences.
57. K-12, career education.	57. Contains questions and answers concerning careers in the ocean sciences.
58. Same as #57.	58. Lists several career education publications.
59. K-12.	59. Lists several free publications in the marine sciences.
60. Same as #59.	60. Lists publications developed as a result of the University of Maine sea grant effort. Publications primarily of a biological nature.

Title	Source
61. Audio-Text Reference Catalog. 1975.	61. Center for Cassette Studies 8110 Webb Avenue North Hollywood, California 91605
62. Parco Scientific.	62. Parco Scientific Co. POB 595 Vienna, Ohio
63. Turtox 76.	63. Turtox/Cambosco 3 MacMillan Science Co. 8200 South Hoyne Avenue Chicago, Ill.
64. Wards Biology Earth Science & Chemistry.	64. Wards Natural Science Establishment Inc. POB 1712 Rochester, N.Y. 14630 and POB 1749 Monterey, California 93940

Usability	Contents
61. Grades 4 through college plus general public.	61. Lists 5000 audio-text cassettes. The publication uses several indexing schemes including a subject matter descriptor. A brief description is included with each title. Some of the marine related titles are, (1) Bio-acoustics and Sharks, (2) The Coelocanth/Fossil Fish Lake, (3) Corals and Shellfish, (4) Crustaceans, (5) Fish Facts, (6) Learning from Dolphins, (7) Mammals of the Sea, (8) Off-Shore Oil Drilling, etc.
62. All Levels.	62. Lists various invertebrate slide sets. Some of the marine slide sets are, (1) Marine Zooplankton-80 slides, (2) Marine Phytoplankton-30 slides, (3) Marine Invertebrate Larva-40 slides, (4) Development and melamorphosis in Marine Invertebrates-160 slides. There are also teaching note listed which accompany each slide set. Several marine related publications are also listed.
63. Same as #62.	63. Contains information concerning live and preserved material, models, publications and other materials usable in teaching marine sciences.
64. Same as #62.	64. Contains information concerning a wide variety of materials useful in the teaching of marine sciences.

Table 2

Catalogs

This table is set up in the same manner as Table 1.

Title	Source
1. Bulletin University of Miami Graduate Program Rosenstiel School of Marine and Atmospheric Sciences	1. 4600 Rickenbacker Causeway Virginia, Key Miami, Florida 33149
2. Inorganic and Organic Laboratory Reagents	2. J. T. Baker Chemical Company 222 Red School Lane Phillipsburg, New Jersey 08865
3. Water Analysis Products for Education.	3. Hach Chemical Company POB 907 Ames, Iowa 50010
4. Wastewater Samplers and Recording Flow Meters	4. Isco Instermen'ation Specialties Company POB 5347 Lincoln, Nebraska 68505

Usability	Contents
1. 7-12, career education.	1. Describes the graduate program at the school and lists courses which are available.
2. Depends on the needs of the user.	2. Lists many reagents which are useful in marine science study.
3. Same as #2.	3. Lists a wide variety of water analysis products.
4. Same as #2.	4. Lists a wide variety of equipment useful in marine science study, and in marine science education.

Table 3

Curriculum Guides

This table is set in the same manner as table 1.

Title	Source
1. Marine Science.	1. Marine Science Education Center School #32 1347 Palmer Street Mayport, Florida 32233
2. Same as #1.	2. Same as #1.
3. Same as #1.	3. Same as #1.
4. Same as #1.	4. Same as #1.
5. Same as #1.	5. Same as #1.
6. Marine Chemistry A Biological Approach.	6. Same as #1.
7. Fish Identification Manual.	7. Same as #1.
8. Marine Messages.	8. Same as #1.

Usability	Contents
1. Grade 1.	1. Teachers guide, listing objetives, materials, activities, activities for field trips and activities to be conducted after the unit has been completed, evaluation exercises and a bibliography of books and marine music. Some of the activities are of the discovery type. The guide also makes some suggestions concerning marine art lessons and experience charts.
2. Grade 2.	2. Same as #1.
3. Grade 3.	3. Same as #1. Takes a closer look at marine communities, leading in the direction of understanding the nature of adaptions and the nature of communities. Introduces students to the organization of animals by class.
4. Grade 4.	4. Deals primarily with ocean currents, basins etc., as well as Florida fisheries. Also contains the same information as #1 except for the bibliography.
5. Grade 5.	5. Contains the same information as #1. Also contains some marine history and career education information.
6.. Grade 11.	6. A 2 week unit. Students demonstrate their abilities on staff created criterion referenced exams. The unit considers the effects of pollution on organisms. (specific types of pollution are considered).
7. K-12 with proper instructor aid.	7. Identifies fish by picture, common name and body characteristics.
8. Same as #7.	8. Descriptions of biological organisms by common name.

Title	Source
9. Plankton of the St. Johs River.	9. Same as #1.
10. Fish Idenification Manual.	10. Same as #1.
11. Transparency Masters Marine Biology.	11. Same as #1.
12. Marine Science Education Center Student Data Book.	12. Same as #1.
13. Marine Biology.	13. Same as #1.
14. Same as #13.	14. Same as #1.
15. A course in Physical Oceanography for Ninth Grade.	15. Same as #1.
16. A Study of Sea Water.	16. Same as #1.
17. A Simple Marine Aquarium.	17. Same as #1.
18. Marine and Environmental Studies Field Manual.	18. Superintendent of Schools Cranston, Rhode Island or Warwick, Rhode Island

Usability	Contents
9. K-12 with proper instructor aid.	9. Gives scientific classification schemes, identifies by picture, common name and scientific name.
10. 7-12 with proper instructor aid.	10. Identifies by picture, genus species and some body characteristics.
11. Teachers of grades K-12.	11. Transparencies to be used as teaching aids with with all of the Marine Science Education Center units.
12. Same as #10.	12. Provides space in which students can record their observations. Includes questions designed to stimulate student thought.
13. Same as #10.	13. A 2 week unit the progress of which is checked by criterion referenced measures. Contains laboratory activities, glossary, definitions of the marine environment and factors affecting it and a picture key for use in identification of marine species.
14. 9-12 with proper instructor aid.	14. Same as #13. Also includes a bibliography.
15. Grade 9.	15. A 2 week course. Contains a list of teacher directions, materials and student activities.
16. 10-12 with proper instructor aid.	16. A 2 week introduction to chemical oceanography.
17. K-12 instructors and students.	17. Contains information on the tank, tank location substrate, water, water filters, and animals.
18. Advanced high school or lower with abstraction.	18. A curriculum guide for a complete high school marine science course. The course covers physical and biological oceanography as well as political and social aspects of the marine environment.

Title	Source
19. Sieur de Monts Spring Environmental Study Area.	19. Superintendent Acardia National Park Bar Harbor, Maine
20. An Oceanographic Curriculum for High Schools. By Robert W. Taber, Leon R. La Porte and Ellsworth C. Smith. Published by the U.S. Naval Oceanographic Office, Washington, D.C.	20. Superintendent of Documents U.S. Government printing Office Washington, D.C. 20402
21. Elementary Teachers Resource Manual 1973-1974 Lightship Chesapeke	21. National Capitol Parks Department of the Interior National Park Service Washington, D.C.
22. Project MER (Marine Ecological Research).	22. Contra Costa County Superintendent of Schools Office Educational Media Services Concord, California 94520
23. Salar: The Leaper.	23. The International Salmon Foundation POB 429 St. Andrews, N.B. Canada
24. New Jersey Marine Sciences Consortium 1976.	24. Office of the Executive Director Fort Hancock, N.J. 07732

Usability	Contents.
19. Designed for K-3 but could be used at a higher level.	19. Contains activities and trail guide in the near sea areas of Arcadia National Park. Based in ecological principles. Contains some bibliography.
20. High school.	20. 18 suggested one hour lectures which cover all aspects of the marine environment. Contains a bibliography of suggested texts and films.
21. Intended for elementary use but could be used K-12.	21. Contains a marine science curriculum which includes nautical aspects as well as biological, weather and physical aspects of the environment.
22. 7-12.	22. A precollege marine science program.
23. Junior high school.	23. A course in the history, geography and science of the sea.
24. K-12.	24. Describes a marine science program covering the inclusive levels.

Table 4

Films

1. Cloud Over The Coral Reef. Available from, Moonlight Publications 2650 California Street, Apartment 13, Mountain View, California 94040, Attn: Dr. Lee Tepley. The film shows how pollution transforms a coral reef into a graveyard. Usable grades 7-12.

2. Fire Under the Sea: The Origin of Pillow Lava. Available from the same source as number 1. The film shows the formation of pillow lava. Usable grades 7-12.

3. The Poisoned Sea. Available from the same source as number 1. The film shows the effects of sewage pollution in coastal waters. Usable grades 7-12.

Table 5

Pamphlets

1. A Career in Ecology. Available from, Department of Biology, Rutgers University, Camden, N.J. 08102. Useful in grades 7-12.

2. A New Family of Marine Polymers Derived from the Shells of Crustaceans. Available from Hercules Incorporated, 910 Market Street, Wilmington, Delaware 19899. Good for advanced high school chemistry and high school career education.

3. After College. Available from, U.S. Coast Guard Public Information Division, U.S. Coast Guard Headquaters, Washington, D.C. 20590. Describes the beginnings of a career as a Coast Guard officer. Usable for career education grades 7-12.

4. American Shad.... A Springtime Delicacy. By Paul R. Nichols and Robert V. Miller 1966. Atlantic States Marine Fisheries Commission, POB 2784, Tallahassee, Florida 32304. Describes the historical importance, life history, range, and sport uses of the American Shad. Useful in grades K-12 for career education as well as science.

5. Atlantic Cod....Beef of the Sea. By Albert C. Jensen. Available from the same source as #4. Describes the life history, the industry and the history of the Atlantic Cod industry. Same uses and levels as #4.

6. Beach and Launch Unit. Available from, Civil Engineering Laboratory, Naval Construction Battalion Center, Port Hueneme, California 93043. Describes the unit's operation. Useful in high school career education.

7. Bird Banding. Available from, U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 20240. Conservation Note #5. Describes the banding program. Useful K-12 with abstraction at the lower levels.

8. Careers for Cartographers. Available from, National Oceanic and Atmospheric Administration, National Weather Service, Silver Springs, Maryland 20910. Useful for career education in grades 7-12.

9. Career for Chemists. Available and useful as #8.

10. Careers for Engineers. Available and useful as #8. Describes ocean science related careers.

11. Careers for Fisheries Biologists. Available and useful as #8.

12. Careers for Hydrologists. Available and useful as #8.

13. Careers for Meteorologists. Available from, U.S. Department of Commerce, remainder of the address as #8. Also useful as #8.

14. Careers for Oceanographers. Available and useful as #8.

15. Careers in Oceanography. By V.T. Neal 1974. Available from Oregon State University, School of Oceanography, Corvallis, Oregon 97331. Useful for career education in grades 7-12.

16. Chesapeake. Available from Lightship Chesapeake, 1200 Ohio Drive S.W., Washington, D.C. 20242. Describes the history of the Lightship and the educational program which now takes place on the ship. Useful for grades K-12.

17. Coast Guard History. CG-213, available from, U.S. Coast Guard Public Information Division, U.S. Coast Guard Headquaters, Washington, D.C. 20590. Describes the Maritime history of the Coast Guard. Useful for career education K-12.

18. Columbia University Graduate Study in Geological Sciences. Available from, Lamont-Doherty Geological Observatory, Palisades, N.Y. 10964. Describes the scope of the graduate program, much of which is related to the marine environment. Useful for career education in grades 7-12.

19. Elevated Causeway. Available and useful as #6. Describes the Causeway's operstion.

20. Endangered and Threatened Wildlife and Plants. Published in the Federal Register September 26, 1975. Available as #7. Contains some marine science information and is useful for high school.

21. Environmental Protection Program. Available and useful as #6. Describes waste disposal and oil spill cleanup as conducted by the Navy.

22. Facts About Federal Wildlife Laws. Available as #7. Useful in grades K-12.

23. Facts About Scripps Institution of Oceanography. Available from, Scripps Institution of Oceanography, 8602 La Jolla, California 92093. Useful for career education in grades 7-12.

24. Fisheries Education No. 1, Soft-Shelled Clam (Mya Arenaria). Available from, Maine Department of Sea and Shore Fisheries, Augusta, Maine 04430. Describes the life cycle and other biological information concerning the soft-shelled clam, as well as presenting information concerning the clam industry. Useful in grades K-12 for career as well as scientific value.

25. Fisheries Education Series Unit No. 2, The Scallop (Pecten magellanicus). By Frederick T. Baird Jr. 1967. Available and useful as #24. Describes the the life cycle and industry. Also included are classroom experiments, questions and answers.

26. Fisheries Education Series Unit No. 3, The Alewife (Pomolobus pseudoharengus). Information and availability same as #25.

27. Fisheries Education Series Unit No. 4, The Sea Herring (Clupea harengus). By Carl J. Sindermann. Other information and availability same as #25.

28. Fisheries Education Series Unit No. 5, The Smelt (Osmerus mordax). Information and availability same as #25.

29. Fisheries Education Series Unit No. 6, Commercial Marine Plants and Algae of Maine. By Robert L. Dow and Alfred J. Fortier. Information and availability same as #25 except that life cycle information is not included.

30. Fisheries Education Series Unit No. 7, The American Lobster (Homarus americanus). Information and availability same as #25.

31. Fisheries Education Series Unit No. 8, The Whiting (Merluccius bilinearis). By Alfred J. Fortier. Information and availability same as #25.

32. Fisheries Education Series Unit No. 9, The Ocean Perch. By Robert L. Dow and Alfred J. Fortier 1963. Other information and availability same as #25.

33. Fisheries Education Series Unit No. 10, The Northern Shrimp. By Spenser Apollonio 1969. Other information and availability same as #25.

34. Fun With the Environment. Available from, The Environmental Protection Agency, Office of Public Affairs, Washington, D.C. 20460. A comic book about the environment and environmental problems. Useful with grades K-6.

35. Haddock....Important New England Foodfish. Available as #4. By Marvin D. Grosslein 1968. Describes the industry, as well as the life cycle of the Haddock. Useful for science and career education in grades K-12.

36. Harvesters of the Sea. Available as #24. A story of Maine's commercial fisheries. Useful for career education in grades K-12.

37. Help Yourself. Available as #3. A guide to enlisted careers in the Coast Guard. Useful for career education in grades 7-12.

38. History Navy Civil Engineering Laboratory. Available as #6. Useful for high school career education.

39. Hard Clam....The Gourmet's Delight. Available as #4. By William S. Miller, Elizabeth M. Wallace, Carl N. Shuster Jr. and Robert E. Hillman. Describes the industry, harvesting, life cycle etc. Useful in grades K-12 for career and science education.

40. Lamont-Doherty Geophysical Observatory Columbia University Bulletin. Available as #18. Discusses the activities of the observatory. Useful for high school career education.

41. Marine Bait Worms....A Valuable Resource. Available from, Atlantic States Marine Fisheries Commission, 1717 Massachusetts Avenue, N.W., Washington, D.C. 20036. By Robert L. Dow and Edwin P. Creaser Jr. Describes sand and bloodworm distribution and the industry. Useful for career and science education in grades 7-12.

42. Marine Environmental Studies. Available from, Superintendent of Schools, Cranston, Rhode Island. Discusses a high school marine biology course. Useful for teachers who are in the process of designing their own marine program.

43. Marine Environmental Studies. Available from, College of Marine Studies, University of Delaware, Newark, Delaware 19711. Discusses a K-12 marine science program and the materials which accompany the program. This is a program which was developed by the university for export to the public schools.

44. Marine Geology Research Beneath the Sea. Available from, Department of the Interior, Geological Survey, Reston, Va. 22092 or the U.S. Government Printing Office, Washington, D.C. 20402. Useful for K-12 career education.

45. Marine Science Consortium. Available from, Marine Science Consortium, POB 43, Minersville, Pa. 17551. Describes the activities of the consortium and the courses offered there. Useful for career education in the high school.

46. Migration of Birds. Available as #7. Conservation note #8. Discusses some marine birds and birds which use the marine environment. Useful in grades 7-12.

47. Naval Environmental Protection Support Service. Available as #6. Describes the activities of the service. Useful for high school career education.

48. Naval Under Sea Center. Available from, Naval Under Sea Center, San Diego, California 92132. Describes the centers activities. Useful for high school career education.

49. Navy Shore and Harbor Facilities. Available as #6. Useful for high school career education.

50. Navy-Wide Environmental Protestion. Available as #6. Describes environmental protection schemes at work in the Navy. Useful for high school career education.

51. NRLS High-Level Radiation Laboratory. Available from, U.S. Naval Research Laboratory, Washington, D.C. 20375. Discusses the lab's activities. Useful for high school career education.

52. Ocean Frontiers, The United States Navy and Oceanography. Available from, Office of the Oceanographer of the Navy, 200 Stovall Street, Alexandria, Va. 22332. Describes some of the Navy's oceanographic activities. Useful for high school career education.

53. Oceanographic Research Tower. Available as #48. Describes the tower. Useful for high school career education.

54. Opportunities After College. Available as #3. Describes the beginning phases of a Coast Guard officer career. Useful in grades 7-12 career education.

55. Opportunity in Resource Management. Available from, Bureau of Land Management, C Street between 18th and 19th, N.W., Washington, D.C. Describes opportunities in the marine minerals field. Useful in grades 7-12.

56. Our Restless Tides. Available, from, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Survey, Washington, D.C. Describes the tides and tide generating forces. Useful in grades 7-12.

57. Particulars Regarding Employment In the U.S. Merchant Marine. Available from, U.S. Department of Commerce, Maritime Administration, Washington, D.C. 20230. Excellent for career education in high school.

58. Project Elf. Available from, Naval Facilities Engineering Command, Washington, D.C. Discusses the development of docking systems. Useful for high school career education.

59. Protecting Our Endangered Birds. Available as #7. Conservation note no. 3. Provides information concerning some marine birds. Useful in grades K-12.

60. Questions and Answers. Available from, Woods Hole Oceanographic Institution, Woods Hole, Ma. 02543. Answers all sorts of questions concerning oceanographic careers and contains a bibliography covering these areas. Useful for career education in grades 7-12.

61. Quick Find 4-75. Available as #48. Describes a program in which Sea Lions were trained to retrieve objects of as much as 2000 pounds from under the sea. Useful for career education in the high school.

62. Research in the Sea. Available as #60. Describes ocean research projects and includes some science. Useful for career education in grades K-12.

63. Rhode Islands Coastal Resources Management Council. Available from, Director, National Sea Grant Program, University of Rhode Island, Kingston, Rhode Island. Describes the councils work on the Rhode Island coast. Useful in high school career education.

64. Saline Water Conversion. Available from, U.S. Department of the Interior, Office of Saline Water, Washington, D.C. or the Superintendent of Documents, Washington, D.C. 20402. Discusses plant activities at Webster, South Dakota. Useful in high school career education.

65. School of Oceanography Oregon State University. Available as #15. Describes the school's oceanography program. Useful in high school career education.

66. Science and Service; A Career in the NOAA Corps. Available from, National Oceanic and Atmospheric Administration, Rockville, Maryland. Describes the different job categories within NOAA. Useful for career education grades 7-12.

67. Sea Water Conversion. Available as #64. Describes plant activities at Wrightsville Beach, North Carolina. Useful for high school career education.

68. Self-Powered Causeway System. Available as #6. Describes the system. Useful for high school career education.

69. Silver Hake...Fish of Many Uses. By Raymond Fritz. Available as #41. Describes the life cycle and range of the Silver Hake and also includes a brief bibliography. Useful in grades K-12.

70. Southern Shrimp...A Valuable Regional Resource. By William W. Anderson and Robert Lunz. Available as #4. Describes the life cycle of the sourhern shrimp and also the southern shrimp industry. Useful for grades K-12 career and science education.

71. Spotted Seatrout...Shallow Water Sport Fish. By C. P. Idyll and William E. Fahy 1970. Available as #4. Describes the life cycle and range of the seatrout; also includes a brief bibliography. Useful in grades K-12.

72. Spiny Dogfish...Fishermans Nuisance. By Albert C. Jensen and Thayer C. Shafer 1973. Available as #41. Contains information concerning range, uses and problems. Useful in grades K-12.

73. Stripped Bass. By Paul R. Nichols, Robert V. Miller, James E. Sykes and Irwin M. Alperin 1966. Available as #41. Describes the history of the importance of the bass, and the industry, as well as the recreational uses. Useful for grades K-12.

74. S-TERI. Available from S-TERI Project, 711 Sandtown Road, Savannah, Georgia 31410. Describes a marine science project which is available for use in the public schools. Useful for teachers who are developing their own marine science programs.

75. Summer Flounder...The Middle Atlantic Flatfish. By Fred E. Lux, Paul E. Hamer, and John C. Poole 1966. Available as #4. Describes the industry and sporting uses. Useful for career education in grades K-12.

76. Technical Activities. Available as #6. Describes the scope of the laboratory's activities. Useful for high school career education.

77. Technology Transfer. Available from Naval Research Laboratory, Washington, D. C. Describes some of the laboratory's activities. Useful for high school career education.

78. Technology Transfer at CEL. Available as #6. Describes the laboratory's activities. Useful for high school career education.

79. The American Lobster. By Robert L. Dow, Phillip L. Goggins and John Hughes 1966. Available as #41. Includes a bibliography, life cycle and industrial information. Useful in grades K-12 for science and career education information.

80. The CEL Seafloor Soils Laboratory. Available as #6. Describes the laboratory's operations. Useful for career education in the high school.

81. The Coast Guard Small Service with a Big Mission. By William S. Ellis. Available as #17. Describes Coast Guard Activities. Useful for career Education in grades K-12.

82. The Coastline of the United States. Available as #66 or from the superintendent of documents, Washington, D. C. 20402, stock number 003-021-00002-5. Describes America's Coastline. Useful in grades K-12.

83. The Edible Blue Crab...Abundant Crustacean. Available as #41. By Willard A. Van Engle, David G. Cargo and Frank J. Wojcik 1973. Describes the crab industry, the crab life cycle and problems of the industry. Useful in grades K-12 for career as well as science education.

84. The Maine Lobster (Homarus americanus). Available as #24. By Phillip Goggins, Alfred J. Fortier, Donald M. Harriman and Robert L. Dow, 1964. Fisheries education series. Contents and usefulness as #22.

85. The National Oceanic and Atmospheric Administration. Available as #66. Describes NOAA operations. Useful for high school career education.

86. The Navy Attacks The Energy Problem. Available as #6. Useful for high school career education.

87. The Navy Fights Pollution. Available as #6. Useful for high school career education.

88. The NOAA Corps. Available as #66. Describes the career pattern of a NOAA officer. Useful for career education in grades 7-12.

89. The Oyster...A Shellfish Delicacy. Available as #41. By Elizabeth M. Wallace and G. Robert Lunz 1968. Describes the life cycle, the industry and the history of the industry. Useful in grades K-12 career and science education.

90. The San Diego Test Facility. Available as #64. Discusses the facilities activities. Useful in high school career education.

91. The Soft Shelled Clam...A Resource With Great Potential. Available as #4. By Dana E. Wallace, Robert W. Hanks, Hayes T. Pfitzenmeyer and Walter R. Welch 1965. Contains industrial information and discusses the clam's life cycle. Useful in grades K-12 career and science education.

92. The United States and the World Ocean. Available from Smithsonian Institution, Washington, D. C. By Don Walsh 1965. Describes oceanography in general and includes some information on ocean research. Useful in grades 7-12 for career and science education.

93. The United States Coast Guard Academy Bulletin of Information. CG-147. Available from USCG Academy, New London, Connecticut. Describes the academy's program. Useful for career education in grades 7-12.

94. The USNS Hayes A New Dimension in Ocean Research. Available as #66. Describes the activities of the Hayes, a twin hulled oceanographic vessel. Useful for career education in grades 7-12.

95. The War Against Pollution. Available as #77. Describes some pollution monitoring activities. Useful in grades 7-12 for science education.

96. There's a Way to Help Others While You Help Yourself. Available as #17. Describes Coast Guard Careers. Useful for career education in grades K-12.

97. Three-Ply Representation of the Major Organ Systems of a Quahaug. Available as #4. Provides excellent simple line drawings of the Quahaug. Useful for grades K-12.

98. Tsunami Warning System in the Pacific. Available from Director, International Tsunami Information Center, POB 3830, Honolulu, Hawaii 96812. Describes the system operation. Useful for high school science.

99. U. S. Army Engineer Waterways Experiment Station. Available from the station, POB 631, Vicksburg, Mississippi 39180. Describes the station operation. Useful in high school career education.

100. United States Coast Guard Ships Planes and Stations. CG-214. Available as #17. Useful for career education in grades K-12.

101. Water of the World. Available as #44. Government Printing Office Stock no. 2401-2189. Useful for grades K-12 science.

102. Welcome to Woods Hole. Available as #60. Describes some of the oceanographic operations which are accomplished at Woods Hole. Useful for career education in grades K-12.

103. Why Is the Ocean Salty? Available from, Department of the Interior, Geological Survey, 1200 South Eads Street, Arlington, Va. 22202 or from the superintendent of Documents, Washington, D.C. Free to educators in quantities no greater than 50. Requests must be made on official stationary. Useful for science instruction in grades K-12.

Table 6

Papers

1. Becoming An Oceanographer. Available from, USCG Public Information Division, USCG Headquaters, Washington, D.C. 20590. By William C. Cummings. Reprinted from Oceans, January 1969, Vol. 1(1). Useful for career education in grades K-12.

2. Economic Development, Department of Marine Resources. Available from, Department of Sea and Shore Fisheries, Augusta, Maine.' Describes the operation of Maine's Department of Marine Resources. Useful for career education in grades 7-12.

3. Experiments in Processing Marine Nodules. Available from, U.S. Department of the Interior, Bureau of Mines, POB 1660, Twin Cities, Minnesota 55111. Useful in high school science.

4. Fishing Business Management. Maine Sea Grant Information Leaflet no. 8, March 1975. Available from, Marine Extension Agent, Ira Darling Center, Walpoe, Maine. Useful for high school career education.

5. Gold in Sea Water---Fact or Fancy. Available as #3. Useful for high school science instruction.

6. History in the Making: Law of the Sea. Available as #4. Maine Sea Grant Leaflet no. 7, January 1975. Useful in high school science instruction.

7. Dehydrated Scallop Viscera, A potential Component. Available as #4. Maine Sea Grant Technical Report #4, 1973. Useful for high school science instruction.

8. Education for Careers in Oceanography. Available as #1. By Charles C. Bates and Willis L. Tressler. Reprinted from Signal, October 1965. Useful for career education in grades 7-12.

9. Ice and Its' Drift Into the North Atlantic Ocean. Available as #1. By Robinson P. Dinsmore. Reprinted from, International Commission for the Northwest Atlantic Fisheries, publication number 8, 1972. Contains information concerning ocean currents. Useful in high school science instruction.

10. Marine Research and Development Projects being Conducted at the University of Maine. Available as #4. Maine Sea Grant Leaflet #1, February 1973. A review article. Useful for high science instruction.

11. Mineral Resource Management of the Outer Continental Shelf. Available from, U.S. Geological Survey, Washington, D.C. 20242. Geological Survey Circular #720, 1975. By M.V. Adams, C.B. John, R.F. Kelly, A.E. Lapointe and R.W. Meurer. Contains an excellent bibliography. Useful for high school science.

12. Mineral Resources of the Northeastern Coast of the United States. Available as #11. Geological Survey Circular #669, 1972. By Frank T. Manheim. Contains a good bibliography. Useful for high school science instruction.

13. Nautical Historians Consider Organizing. Available as #4. Maine Sea Grant leaflet #3, March 1974. By Clark G. Reynolds. Useful in high school instruction.

14. Oceanography in the National Survey. Available from, U.S. Department of Commerce, NOAA, National Ocean Survey, Rockville, Maryland, 1971. Education pamphlet #6. Contains career and physical oceanographic material. Useful for grades 7-12, career and science instruction.

15. Oyster Culture in Maine Specifications and Approximate Costs of Rearing Equipment. Available as #4. By Mark S. Richmond. Maine Sea Grant leaflet no. 5, August 1974. Useful for career education in the high school.

16. Prelimary Check List of Planktonic Microalgae from the Gulf of Maine. Available as #4. By Bernard J. McAlice. Maine Sea Grant Information Leaflet no. 9, March 1975. Useful for high school science instruction after abstraction.

17. Preliminary Observations Concerning the Nutritive Value of Dehydrated Scallop Viscera as a Component of Poultry Rations. Available as #4. By D.L. Blamberg, D.C. Harris and T.A. Bryan. Maine Sea Grant technical report #5, March 1973. Useful for high school science instruction after abstraction.

18. Preliminary Process Development Studies for Desulfating Great Salt Lake Brines and Sea Water. Available as #3. By Darcy R. George, J.M. Riley and Laird Crocker, 1967. Useful for high science instruction.

19. Processing Manganiferous Sea Nodules. Available as #3. Useful in high school science instruction.

20. Sand and Gravel on the Continental Shelf off the Northeastern United States. Available as #11. Geological Survey Circular #602, 1968. Contains a good bibliography. Useful in high school instruction.

21. Subsea Mineral Resources and Problems Related to their Development. Available as #11. Geological Survey Circular #619, 1969. By V.E. Mckelvey, J.T. Tracey Jr., George E. Stoertz and John G. Vedder. Useful for high school instruction.

22. The Capital Construction Fund. Available as #4. By Bender, Norman K. Maine Sea Grant Information Leaflet no. 4, April 1974. Useful in high school instruction.

23. The International Ice Patrol. Available as #1. Describes the ice patrols and the mission of the ice patrol. Useful for career education in grades K-12.

24. The New Maine Oyster Industry. Available as #4. By Carleen Ehrbar. Maine Sea Grant Information Leaflet no. 11, September 1975. Useful for career education in grades K-12.

25. The Ocean Food and Energy Farm Project. Available from, The Cousteau Society Inc., 777 Third Avenue, New York, N.Y. 10017. Presented at the International Conference on Marine Technology Assessment, Monte Carlo, Monaco, October 26, 1975. Useful for career education in grades 7-12.

26. Those Alluring Careers in Ocean Sciences. Available from, Scripps Institute of Oceanography, La Jolla, California. Reprinted from Kiplinger, 1970. Discusses oceanography careers and salaries. Useful for career education in grades 7-12.

27. Tidal Currents. Available as #14. Education pamphlet #4. Useful for grades K-12 science instruction.

28. Today's Youth in Tomorrows Sea. Available from, U.S. Department of Commerce, NOAA, National Sea Grant Program, Rockville, Maryland 20852. Useful for grades K-12 career education.

29. Understanding the Emergency Energy Shortage Loan Program. Available as #4. By Kenneth J. Roberts. Maine Sea Grant Information Leaflet no. 10, March 1975. Useful for high school career education.

30. Water Movements in the Atlantic Ocean. Available as #4. By Paul D. Ring. Maine Sea Grant Information Leaflet no. 4, April 1974. Useful for science instruction in grades 7-12.

Table 7

Periodicals

1. Biology Digest. Available from, Data Courier Inc., 620 South Fifth Street, Louisville, Kentucky 40202. Contains abstracts from several dozen periodicals. The source of many good articles in the marine science field. Useful for K-12 science instruction with proper abstraction.

2. Calypso Log. Available from, The Cousteau Society, 777 Third Avenue, New York, N.Y. 10017. Useful for science instruction in grades 4-12.

3. Gulfstream. Available from, Superintendent of Documents, U.S. Goverment Printing Office, Washington, D.C. 20402. A monthly publication of the National Oceanic and Atmospheric Administration. Useful for grades K-12 science instruction.

4. Naval Research. Available from, Department of the Navy, Office of Naval Research, Arlington, Va. Reviews naval research projects. Useful for high school career and science education.

5. Navy Civil Engineer. Available from, Naval Facilities Engineering Command, Alexandria, Va. 22332. Discusses many marine activities. Useful for high school career education.

6. Oceanus. Available from, Woods Hole Oceanographic Institution, Woods Hole, Ma. 02543. Contains biological and physical oceanographic information. Useful for high school science instruction.

7. Sea Frontiers. Available from, International Oceanographic Foundation, 10 Rickedbacker Causeway, Virginia Key, Miami, Florida 33149. Contains marine science information and reviews of recent books published in the marine science field. Useful for K-12 science instruction.

Table 8

Reports

1. Annual Report of the Marine Mammal Commission. Available from, Marine Mammal Commission, 1625 Eye Street, N.W., Washington, D.C. An account of the commissions activities for the year. Contains some taxonomic information as well as general biological information. Useful in grades 7-12 career and science education.

2. Maine Sea Grant 1973-1974. Available from, Marine Extension Agent, Ira Darling Center, Walpole, Maine. Discusses the program activities from May 1971-April 1972. Useful in high school career education.

3. 1973-1974 Saline Water Conversion Summary Report. Available from, U.S. Department of the Interior, Office of Saline Water, Washington, D.C. or Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, stock no. 2400-00796. Discusses converting salt water to fresh water. Useful in high school career education.

4. Scripps Institute of Oceanography Annual Report. Available from, Public Affairs Officer, 8602 La Jolla Shores Drive, La Jolla, California 92093. Describes the years activities and provides a useful bibliography. Useful in grades 7-12 career and science education.

5. The University of Maine Coeherent Project Sea Grant Program. Available as #2. Discusses the program activities from May 1971-April 1972. Useful for high school career education.

6. Woods Hole Oceanographic Institution Annual Report. Avaliable from, Woods Hole Oceanographic Institution, Woods Hole Ma. Discusses the year's activities at the institution. Useful for career and science education in grades 7-12.

Table 9

Texts

1. Assessing Potential Ocean Pollutants. Available from, National Academy of Sciences Printing and Publishing Office, 2101 Constitution Avenue, Washington, D.C. 20418. Useful after abstraction, in high school science instruction.

2. Beneficial Modifications to the Marine Environment. Available and useful as #1.

3. Directory of Marine Science Education. Available from, Center for Wetland Resources, Louisiana State University, Baton Rouge, La. 70803. By James P. Schweitzer. Lists names of several hundred precollege marine science instructors. Useful for teachers of precollege marine sciences who wish to correspond with others in the field.

4. Exploring the Reef. Available from, A.S., Barnes & Company, Cranbury, N.J. By Straughan. Useful in grades 4-12.

5. Fact Book Naval Research Laboratory. Available from, Naval Research Laboratory, Washington, D.C. 20375. Describes the activities conducted at the laboratory. Useful for career education in high school.

6. Fishes. Available from, Golden Press, New York, N.Y. By Zim and shoemaker. Useful in grades K-8.

7. Guide to the Water. Available from, Sterling Publishing Company, Inc. New York, N.Y. By Slosky & Walker. Useful in grades 4-12.

8. How to Keep Salt Water Fishes. Available from, Pet Library Ltd. Useful for teachers at all levels.

9. Maine's Marine Industries Vocational Education Planning Guide. Available from, Marine Extension Agent, Ira Darling Center, Walpole, Maine. By Gregory C. Griffin and Dana R. Darling. Contains needs assessment information for Maine's marine industries. Useful for instructors of vocational education.

10. Marine Chemistry. Available and useful as #1

11. Marine Education: Guidelines for Curriculum Development. Available from,Curriculum Development Branch, Department of Health Education and Welfare, U.S. Office of Education, Washington, D.C. 20202. Describes the status of marine career education in the U.S. as of July 1, 1975. Useful to teachers at all levels.

12. Marine Environmental Quality. Available from, National Academy of Sciences, Washington, D.C. Useful for teachers interested in developing environmental quality units.

13. Mining in the Outer Continental Shelf and in the Deep Ocean. Available as #1. Also useful as #1.

14. National Environmental Study Area: A Guide. Available from, Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, stock number 2405-0484. Published U.S. Department of the Interior, National Park Service. A guide for developing areas. Useful for grades 7-adult.

15. National Sea Grant Program. Available from, U.S. Department of commerce, National Oceanic and Atmospheric Administration, Office of Sea Grant, Rockville, Maryland 20852. Contains a description of the National Sea Grant Program and suggestions for preparing Sea Grant proposals. Useful to teachers in Sea Grant States.

16. Nuclear Merchant Ships. Available and useful as #1.

17. Numerical Models of Ocean Circulation. Available and useful as #1.

18. Oceanography in Action. Available from, U.S. Naval Oceanographic Office, Washington, D.C. 20373. By S.E. Seim. Describes the Navy's oceanographic program and presents some scientific information. Useful for grades 7-12 career education.

19. Oceanography and Our Future. Available from, Globe Book Company, 175 Fifth Avenue, New York, N.Y. 10010. By Joseph M. Goldfeld and J.J. Burton, 1975. This a grade 7-12 oceanography text, written especially for that purpose. There is also a teachers guide available for the text.

20. Opportunities in Oceanography. Available from, Smithsonian Institution Press, Washington, D.C. 20560. Useful for grades 7-12 career education.

21. Petroleum in the Marine Environment. Available and useful as #1.

22. Questions About the Oceans. Available as #14. Provides a good initial exposure to oceanography for both teachers and students. Useful in grades K-12.

23. Radioactivity in the Marine Environment. Available and useful as #1.

24. Seashores. Available from, Golden Press, New York, N.Y. Useful for instruction in grades 7-12.

25. Salt Water Aquarium Fishes. Available from, T.F.H. Publications, Jersey City, N.J. By Axelrod. Useful for grades K-12.

26. Secrets of the Sea. Available from, Xerox Education Publications, Education Center, Columbus, Ohio. Publication no. 342. Discusses the importance of the seas. Useful in grades 7-9.

27. Secrets of the Sea. Available from, American Education Publications Education Center, Columbus, Ohio 43216. Excellent oceanography for young scientists. Useful for grades K-9.

28. The A-B-Seas of Desalting. Available as #14. Published by U.S. Department of the Interior, Office of Saline Water. Discusses several methods of desalting. Useful for career education in grades 7-12.

29. The Great Alaska Earthquake of 1964: Oceanography and Coastal Engineering. Available and useful as #1.

30. The Marine Aquarium for the Home Aquarist. Available from, Great Outdoors Publications Co., St. Petersburg, Florida. By Robert F. O'Connell. Useful for teachers of grades K-12.

31. The Ocean Science Program of the U.S. Navy. Available from, Maury Center for Ocean Science, Department of the Navy, Washington, D.C., or Office of Naval Research, Code 480, Arlington, Va. 22217. Describes the Navy's ocean science program, Also includes the history of the Navy's ocean science program. Useful in grades K-12.

32. The Water Planet. Available from, Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Describes Oceanography and Ocean Sciences generally and includes some scientific information. Useful for career and science education in grades K-12.

33. Toward Fulfillment of a National Ocean Commitment. Available and useful as #1.

34. Understanding Climatic Change. Available and useful as #1.

35. U.S. Directory of Marine Scientists. Available as #1. Lists over 3000 practicing marine scientists. Useful for career education in grades 9-12.

TABLE 10

Classification of Materials by Subject

Each entry from Tables 1-9 is listed in this table. The entries are made as pairs of numbers, for example, 5-67. In the example as in the real entries, the first number of the pair (5 in the example) represents the table from whence the pair originated. The second number of the pair (67 in the example) represents the ordinal position of the entry in the table whence the pair originated. The entry 5-67 then refers to the 67th entry in table 5.

Biological	Career	Law	Pollution	Physical/Chemical
1-1, 2, 3, 4, 5, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 27, 28, 20, 31, 33, 34, 36, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 49, 55, 56, 57, 59, 60, 61, 62; 3-1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 18, 20, 21, 22, 23, 24; 4-1; 5-4, 5, 7, 16, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 39, 41, 42, 43, 46, 59, 69, 70, 71, 72, 73, 74, 75, 79, 83, 84, 89, 91, 92, 97; 6-7, 10, 16, 17; 7-1, 2, 4, 6, 7; 8-1, 4, 6; 9-2, 4, 6, 8, 19, 24, 25, 26, 27	1-1, 2, 3, 4, 5, 6, 7, 8, 12, 13, 14, 16, 17, 18, 19, 23, 30, 32, 35, 42, 44, 45, 46, 47, 49, 52, 54, 55, 56, 57, 58, 59, 60, 61; 2-1; 3-4, 5, 20, 24; 4-1; 5-1, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32,33, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 47, 48, 49, 50, 51, 52, 53, 54, 55, 57, 58, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 73, 74, 75, 76, 77, 78, 79, 80, 81, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 96, 99, 100, 102; 6-1, 2, 4, 8, 13, 14, 15, 22, 23, 24, 25, 26, 28, 29; 7-4, 5, 6, 7; 8-1, 2, 3, 4, 5, 6; 9-3, 5, 9, 11, 15, 16, 18, 20, 22, 29, 31, 32, 35	1-1, 2, 3, 42, 47, 55, 60; 5-22; 6-6; 7-7	1-1, 2, 3, 8, 12, 13, 14, 15, 25, 42, 44, 46, 55, 57, 60; 3-6, 20; 4-3; 5-21, 34, 74, 87, 95; 7-1, 2, 7; 9-1, 12, 19, 21	1-1, 2, 3, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 26, 27, 28, 29, 30, 35, 37, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 53, 55, 56, 57, 59, 60; 2-2, 3, 4; 3-4, 11, 13, 14, 15, 16, 18, 20, 21, 22, 24; 4-2; 5-2, 16, 42, 43, 56, 74, 82, 92, 98, 101, 103 6-3, 5, 9, 10, 11, 12, 14, 18, 19, 20, 21, 22, 30; 7-1, 2, 3, 4, 5, 6, 7; 8-4, 6; 9-2, 7, 10 13, 17, 19, 23, 26, 27, 28, 29, 32, 34

TABLE 11

Classification of Materials by Usability Level

Entries in this table are made in the same manner as those made in Table 10.

K-12	4-12	7-12	7-9	High School	K-8	K-6
1-1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 16, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 36, 37, 38, 39, 42, 44, 45, 47, 49, 50, 51, 53, 54, 55, 57, 58, 59, 60, 62, 63, 64; 2-2, 3, 4; 3-7, 8, 9, 11, 17, 24; 5-4, 5, 7, 16, 17, 22, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 39 43, 44, 59, 62, 29, 70, 71, 72, 73, 74, 75, 79, 81, 82, 83, 84, 89, 96, 97, 100, 101, 102, 103; 6-1, 23, 24, 27; 7-1, 3, 7; 9-3, 8, 11, 12, 15, 22, 25, 30, 31, 32	1-61; 9-4, 7	1-32, 43; 2-1; 3-10, 12, 13, 22; 4-1, 2, 3; 5-1, 3, 8, 9, 10, 11, 12, 13, 14, 15, 18, 23, 37, 40, 41, 46, 54, 55, 56, 60, 66, 88, 92, 93, 94, 95; 6-2, 8, 14, 25, 26, 28, 30; 8-1, 4, 6; 9-14 18, 19, 20, 24, 28	1-41; 3-15, 23; 9-26	1-27, 46, 48, 52; 3-6, 14, 16, 18, 20; 5-2, 6, 19, 20, 21, 38, 42, 45, 47, 48, 49, 50, 51, 52, 53, 57, 58, 61, 63, 64, 65, 67, 68, 76, 77, 78, 80, 85, 86, 87, 90, 98, 99; 6-3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 29; 7-4, 5, 6; 8-2, 3, 5; 9-1, 2, 5, 9, 10, 13, 16, 17, 21, 23, 29, 33, 34, 35	1-19; 9-6, 27	1-40; 3-1, 2, 3, 4, 5, 19, 21; 5-34

References

Earney, Fillmore C. F., Ocean space and seabed mining. Journal of Geography, 74(6): 539-547; December 1975.

Appendix

UNIVERSITY OF MAINE *at Orono*

College of Education

Shibles Hall
Orono, Maine 04473
207/581-7020

Dear Sir:

We are designing a module of Marine Studies for inclusion in a teaching of science methods course which is required of all future public school science teachers. Materials used in the module will be those obtained from a variety of sources and will take the place of a standard text.

If your organization has pamphlets, bibliographies and other publications available, which we might include in our K-12 module, I would appreciate your supplying us with a copy of said publications. In this context, historical and career information would be appropiate as well as biological, physical and chemical oceanographic information.

Your interest in this matter is gratefully appreciated.

Sincerely,

Richard M. Schlenker